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THE MOST COMMON RANGE OF AXIAL LENGTH IN PATIENTS UNDERGOING CATARACT EXTRACTION IN PAKISTANI POPULATION

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Abstract

Background: According to a Pakistan national survey, among various causes of blindness as well as visual impairment, cataract accounts for 51.5% of them. Cataract Surgery is the most commonly performed type of surgery. The refractive outcome following cataract surgery is dependent upon the axial length measurement, intra ocular lens (IOL) power calculation formula and the quality of the lens implant. The main objective was therefore to confirm the common range of axial length in Pakistani population.

Objective: To determine the frequency of patients falling in various ranges of axial length recorded and most common range in our community undergoing cataract extraction.

Methods: A cross sectional study conducted at department of Ophthalmology, Sir Ganga Ram Hospital, Lahore. 400 patients, fulfilling the inclusion criteria were selected. Axial length measured separately on each eye. A total of 10 measurements were taken for each eye, mean of which recorded in the proforma designed for the study. Data analysis was done using IBM SPSS version 20.0.

Results: The patient's age ranged between 40-70 years with a mean of 56.92±9.15 years. 206 (51.5%) patients were males and 194 (48.5%) females. The mean axial length was 22.93±1.28mm and 22.86±1.19mm in right and left eyes respectively. The most common axial length ranged between 19-23mm in both eyes (57.5% in right eye, 59.3% in left eye) followed by 23-25mm (40.3% in right eye, 38.5% in left eye). There was no significant variation in axial length across age and gender.

Conclusion: The commonest range of axial length in Pakistani population is 19-23mm followed by 23-25mm regardless of age and gender.

Keywords: Axial Length, IOL Power Calculation, Cataract Extraction.

Introduction

The word “cataract” originates from the Greek word waterfall. It was assumed that opaque material ran into the lens of the eye like a waterfall causing blurred vision. It has been shown in a survey of Pakistan National Blindness and Visual Impairment that cataract is responsible for more than 50% i.e., 51.5% of total visual impairment as well as blindness in the country (1). Nuclear cataract is the most common cataract form that leads to opacification of nucleus of the lens, central opacification from cortex to the periphery and also often had spokes that are wedge shaped attributed to cortical cataract, often with typical wedge shaped spokes and distinct opacities that arise on posterior capsule from central or para-central position featuring posterior sub capsular cataract (2). Cataract Surgery is one of the most commonly performed type of surgery in ophthalmology (3).

The number of factors determines the refractive outcome following the cataract surgery. They include measurement of axial length, IOL power calculation formula, keratometry and also the quality of implanted lens (4,5). The important step that determines the better refractive outcome among examinations performed prior to cataract surgery is the correct power calculation regarding IOL (6).

Axial length carries more importance in calculating IOL power as its variation causes a gross change in IOL power and post-operative refractive errors. Excellent and high quality results or outcome is dependent upon exact axial length measurement, anterior chamber depths measurements, keratometry, accurate IOL power calculation and no doubt good surgery (7).

Axial Length is the most important variable in determining the exact biometry for eye because 1mm difference in axial length will give 3 diopters of difference in IOL power calculation and hence the goal of biometry will not be achieved so one has to be very precise in checking the axial length.

In a local study, 57.9% patients had range of axial length 19-23mm, 39.8% had 23-25mm and 2.3% had 25-28mm.1 In another local study, most (44.6%) patients had axial length of 19-23mm, 49.1% had 23-25mm and 5.9% had 25-29mm.7 As, there is variation in axial length documented in our local population, this study was to define a particular range of axial length in our population.

Methodology

A descriptive cross sectional study that was approved by ethical review committee of Sir Ganga Ram Hospital (SRGH), Lahore and conducted at the department of opthalmology SRGH, Lahore during April-September, 2013. The 400 patients were selected through consecutive sampling fulfilling the inclusion criteria: a) age range (40-70) years having cataract b) Both male and female patients and c) Normal retina on fundoscopic examination. Exclusion criteria included those Patients with corneal pathologies like corneal opacity and spheroidal degeneration as assessed on slit lamp examination, known cases of glaucoma and patients with posterior segment problems like retinal detachment, vitreous hemorrhage and diabetic retinopathy on indirect ophthalmoscopy. Demographic data like name, age, sex was recorded. Ultrasound A Scan II machine was used to measure axial length of eye with patient in supine position under topical anesthesia (proparacaine 0.5%) by a single operator on each eye and average of 10 readings was taken. Data was entered and analyzed using IBM SPSS 15.0 software (IBM Corporation, Armonk, NY). Quantitative variables like age, axial length were described by mean±SD and range. Qualitative variables like gender, number of patient falling in different ranges of axial length were presented by frequency and percentage.

Results

400 patients were included in this cross sectional study. The age of the patients ranged from a minimum of 40 year to 70 years maximum with a mean of 56.92±9.15 years as shown in table 1. 206 of total patients were males contributing 51.5% of the total population studied while 194 were female (48.5%) as shown in table 1. The axial length of the right eye ranged from 19.46mm to 29.76mm with a mean of 22.93±1.29mm while of the left eye it ranged from 19.43mm to 29.53mm with a mean of 22.86±1.19mm as shown in table 1. Axial length was further categorized into three different ranges and frequency of these ranges in both eyes was determined. It was found that the commonest range of axial length in both eyes was 19-23mm; contributing 57.5% in right eye and

59.3% in left eye followed by 23-25mm which was 40.3% in right eye and 38.5% in left eye. Only a small number of patients had axial lengths in the range of 25-29mm in both eyes as shown in table 1.

Table1: Age, Gender and Axial Length (Both Eyes) of the Patients

Variable		**Frequency**	**Percentage**
Age (Years) 56.92±9.15*	40-49	90	22.5
	50-59	85	21.2
	60-70	225	56.3
Gender	Male	206	51.5
	Female	194	48.5
Axial Length (Right Eye) 22.93±1.29*	19-23	230	57.4
	23-25	161	40.3
	25-29	09	2.3
Axial Length (Left Eye) 22.86±1.19*	19-23	237	59.2
	23-25	154	38.5
	25-29	09	2.3
Total		400	100

*Mean±SD

We further cross tabulated the axial lengths with the gender of the patients as shown in table 2. It was found that there was no significant variation in axial length across the gender with 19-23mm being the commonest range of axial length in both eyes of either gender followed by 23-25mm. Patients were divided into groups depending upon their age to see distribution of axial length across various age groups. It was found the axial length was again unaffected by age just like gender and the commonest range was 19-23mm followed by 23-25mm in both eyes in all age groups as shown in table 3.

T**able2: Association between Gender with Axial Length**

Axial Length Right eye	**Variable**		**Total**	**p- value**
	Male	**Female**		
19-23mm	110	120	230	0.025*
23-25mm	94	67	161	
25-29mm	2	7	9	
Total	206	194	400	
Axial Length Left Eye	Variable		Total	p- value
	Male	Female		
19-23mm	116	121	237	0.47
23-25mm	85	69	154	
25-29mm	5	4	9	
Total	206	194	400	

* Significant (p-value ≤ 0.05)

Table3: Association between Age (Years) with Axial Length

Axial Length Right eye	**Variable Age (Years)**			**Total**	**p- value**
	40-49	50-59	60-70		
19-23mm	45	53	132	230	0.463

23-25mm	43	31	87	161	
25-29mm	2	1	6	9	
Total	90	85	225	400	
Axial Length Left Eye	**Variable Age (Years)**			**Total**	**p- value**
	40-49	50-59	60-70		
19-23mm	46	53	138	237	0.25
23-25mm	41	32	81	154	
25-29mm	3	0	6	9	
Total	90	85	225	400	

Discussion

This study was an attempt to find out common axial length in Pakistani patients who undergo cataract surgery it was found that most of such patients had axial length in the range of 19-23mm (57.5%). The second commonest range was 23-25mm (40.2%) with only a small percentage of patients had axial length greater than 25mm (2.3%). These results closely agree with those obtained previously by Saleem et al. in 2009 in Pakistani population who documented that 57.9% patients had axial length in the range of 19-23mm, while 39.8% had 23-25mm and 2.3% had 25-29mm1. The results of our study however are only comparable to those obtained by Javed et al. in 2008 who showed that majority of the patients had axial length in the range of 23-25mm (49.18%) followed by 19-23mm (44.69%) (7).

In the present study it was found that the commonest range of axial length was 19-23mm regardless of the age and gender of the patient in both eyes with a mean of 22.93mm in right eye and 22.86mm in left eye. These results correlate well with Warrier et al. (2008), who studied axial length in Myanmar8 and showed that the average axial length was 22.76mm. Also these match closely with the results of the other authors (9-13). Though there are small variations but these can be attributed to geographical and genetic differences among different populations.

We evaluated the axial length of our community, as it will help in calculating the IOL power which is essential for IOL implant after cataract extraction. In our study we found most of the patients in the range of 19-23mm axial length, it will help the IOL manufacturers to make more IOL in this particular range which will be used in our clinical practice.

There were certain limitations observed in this study. First, applanation biometry method was used which yields a false short axial length due to variable amount of corneal compression. Even the slightest indentation can cause significant measurement errors which are magnified when the eyeball is short. The most sophisticated form of ultrasound based biometry is a combined immersion A/B scan and second we included patients of age 40-70 years and few international studies show there is definite variation in axial length in different age groups but our study showed very stable results irrespective of age and gender. It needs to conduct more phases of study in younger age group as well to see more variation in axial length in our population.

Conclusion

In our study, the commonest range of axial length in Pakistani population is 19-23mm followed by 23-25mm regardless of patient's age and gender.

References

1. Saleem M, Khan SB, Khattak MA, Muhammad L. Analysis of intra ocular lens power estimation in patients admitted for cataract surgery. Gomal J Med Sci 2009; 7(1):22-6.

2. Chylack LT Jr, Wolfe JK, Singer DM, Leske MC, Bullimore MA, Bailey IL, Friend J, McCarthy D, Wu SY. The Lens Opacities Classification System III. The Longitudinal Study of Cataract Study Group. Arch Ophthalmol 1993; 111(6):831-6.
3. Lim LH, Lee SY, Ang CL. Factors affecting the predictability of SRK II in patients with normal axial length undergoing phacoemulsification surgery. Singapore Med J 2009; 50(2):120-5.
4. Norrby S. Sources of error in intraocular lens power calculation. J Cataract Refract Surg 2008; 34(3):368-76.
5. Preußner P-R, Olsen T, Hoffmann PC, Findl O. Intraocular lens calculation accuracy limits in normal eyes. J Cataract Refract Surg 2008; 34:802–8
6. Lagrasta JM, Allemann N, Scapucin L, Moeller CT, Ohkawara LE, Melo LA Jr, Soriano ES, Casanova FH. Clinical results in phacoemulsification using the SRK/T formula. Arq Bras Oftalmol 2009; 72(2):189-93.
7. Javed EA, Sultan M. Cataract surgery; axial length variation. Professional Med J 2008; 15(3):387-91.
8. Warrier S, Wu HM, Newland HS, Muecke J, Selva D, Aung T, Casson RJ: Ocular biometry and determinants of refractive error in rural Myanmar: the Meiktila Eye Study. Br J Ophthalmol 2008; 92(12):1591-4.
9. He M, Huang W, Li Y, Zheng Y, Yin Q, Foster PJ: Refractive error and biometry in older Chinese adults: the Liwan eye study. Invest Ophthalmol Vis Sci 2009;50(11):5130-6.
10. Fotedar R, Wang JJ, Burlutsky G, Morgan IG, Rose K, Wong TY, Mitchell P: Distribution of axial length and ocular biometry measured using partial coherence laser interferometry (IOL Master) in an older white population. Ophthalmology 2010;117(3):417-23.
11. Shufelt C, Fraser-Bell S, Ying-Lai M, Torres M, Varma R: Refractive error, ocular biometry, and lens opalescence in an adult population: the Los Angeles Latino Eye Study. Invest Ophthalmol Vis Sci 2005;46(12):4450-60.
12. Jivrajka R, Shammas MC, Boenzi T, Swearingen M, Shammas HJ: Variability of axial length, anterior chamber depth, and lens thickness in the cataractous eye. J Cataract Refract Surg 2008;34(2):289-94.
13. Velez-Montoya R, Shusterman EM, Lopez-Miranda MJ, Mayorquin-Ruiz M, Salcedo-Villanueva G, Quiroz-Mercado H, Morales-Canton V: Comparison of the biometric values obtained by two different A-mode ultrasound devices (Eye Cubed vs. PalmScan): a transversal, descriptive, and comparative study. BMC Ophthalmol 2010;10:8.